

## Supporting Information

Aqueous  $d_4$ -PA solutions were prepared by exchanging 0.1 M solutions of  $h_4$ -PA in  $D_2O$  at pH 1.0. Pyruvic acid can exchange *all* protons via acid-catalyzed enolization.<sup>1</sup> Full isotope exchange was confirmed by HPLC analysis of  $h_4$ -PA/ $D_2O$  solutions that had been prepared at least one month in advance, using electrospray ionization mass spectrometry detection (ESI MS Agilent 1100 series) in the negative ion mode (Fig. 1).

<sup>1</sup> Chiang, Y.; Kresge, A. J.; Pruszynski, P. *J. Am. Chem. Soc.* **1992**, *114*, 3103.

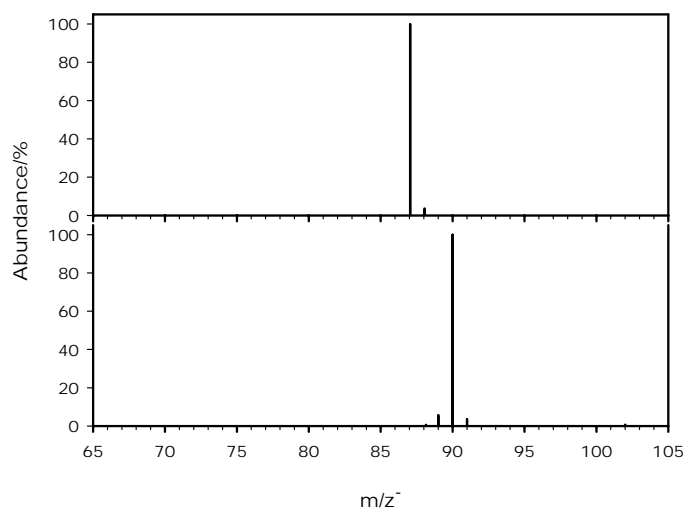


Figure 1